# QB365 SCHOOL ASSESSMENT SOFTWARE
## 12TH STANDARD - PHYSICS
## MODEL QUESTION PAPER

Exam Time: 05:05 Hrs
Date: 05/03/2026

Total Marks: 90

---

**Multiple Choice Question** 12 x 1 = 12

1.Which one of the following phenomena confirms that light waves are transverse?

(a) interference (b) diffraction (c) dispersion (d) polarization

2.The angle between pass axis of polarizer and analyzer is 45˚The percentage of polarized light passing through analyzer is

(a) 100% (b) 50% (c) 25% (d) 75%

3.In a vessel of depth 15cm, liquid is poured till the liquid appears to be at half the depth, the liquid level is 5cm from the top. Calculate the refractive index of the liquid.

(a) 1.33 (b) 3.30 (c) 1.5 (d) 1.7 (e) 2

4.A blue cross on a white background is illuminated with white light and is observed through a red filter. What is seen?

(a) A red cross on a black background
(b) A black cross on a red background
(c) A red cross on a blue background (d) A blue cross on a red background

5.A lens is behaving as convex lens in air and concave in water, then its refractive index is

(a) Small than air (b) Greater than both air and water
(c) Greater than air, but less than water (d) Almost equal to water

6.What is path difference for destructive interference?

(a) nλ (b) $n(\lambda+1)$ (c) $(2n+1)\frac{\lambda}{2}$ (d) $(n+1)\frac{\lambda}{2}$

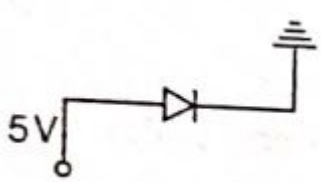
7.Relativistic corrections become necessary when the expression for the kinetic energy $\frac{1}{2}mv^2$ becomes comparable with $mc^2$ where m is the mass of the particle. At what de-Broglie wavelength will relativistic corrections become important for an electron?

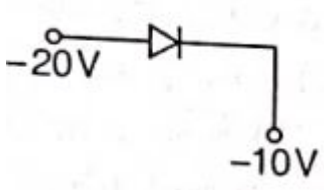
(a) $\lambda = 10nm$ (b) $\lambda = 10^{-1}nm$ (c) $\lambda = 10^{-4}nm$ (d) $\lambda = 10^{-6}nm$

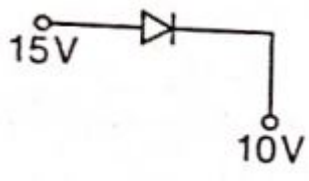
8.According to Einstein's photoelectric equation, the plot of the kinetic energy of the emitted photoelectrons from a metal verses the frequency of the incident radiation gives a straight line whose slope.

(a) depends on the nature of the metal used
(b) depends on the intensity of the radiation
(c) depends both on the intensity of the radiation and the metal used
(d) is the same for all metals and independent of the radiation.

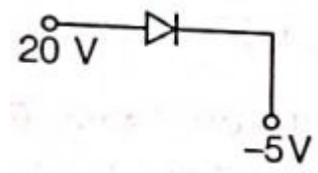
9.Which is reverse biased diode?

(a) 

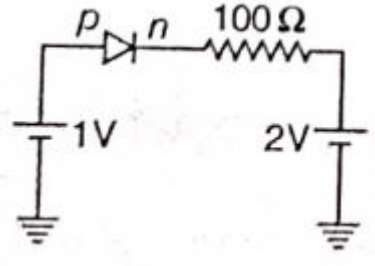

(b) 


(c) 

(d)




10.The current through an ideal p-n junction shown in the following circuit diagram will be




(a) zero (b) 1 mA (c) 10 mA (d) 30 mA

11 A plano-convex lens of curvature of 30 cm and refractive index 1.5 produces a real image of an object kept 90 cm from it. What is the magnification?

(a) 4 (b) 0.5 (c) 1.5 (d) 2

12 A ray of light passes through an equilateral glass prism in such a manner that the angle of incidence is equal to the angle of emergence and each of these angles is equal to 3/4 of the angle of the prism. The angle of deviation is

(a) 45° (b) 39° (c) 20° (d) 30°

QB 365 TM
QUESTION BANK 365

**2 Marks** 6 x 2 = 12

13.Which of the following waves can be polarised

(i) Heat waves or

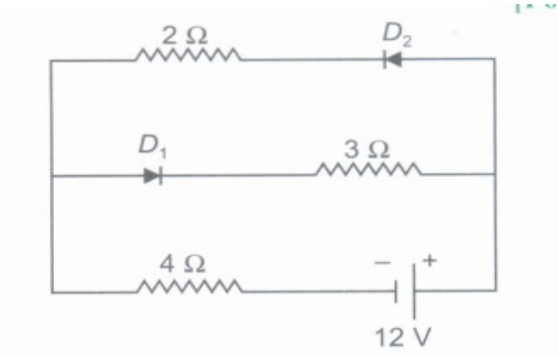
(ii) Sound waves?

Give reason to support your answer.

14.Does each incident photon essentially eject a photoelectron?

15 Draw a graph to show the variation of stopping potential with frequency of radiation incident on a metal plate. How can the value of Planck's constant be determined from this graph?

16.a. The circuit shown in the figure has two oppositely connected ideal diodes connected in parallel. Find the current flowing through each diode in the circuit.




**(OR)**

b. The power of a thin lens is + 5D. When it is immersed in a liquid, it behaves like a concave lens of focal length 100 cm. Calculate the refractive index of the liquid. Given, refractive index of glass = 1.5.

17. In a typical nuclear reaction e.g
$_1^2H + _1^2H \longrightarrow _2^3He + n + 3.27MeV$
although number of nucleons is conserved,yet energy is released.How? Explain.

**3 Marks** 8 x 3 = 24

18. A screen is placed 200 cm away from a narrow slit which is illuminated with light of wavelength $60 \times 10^3$cm. If the First minimum lies 5mm on either side of central maximum, calculated the slit width.

19. (i) Light passes through two polaroids $P_1 and P_2$ with pass axis of $P_2$ with pass axis of $P_2$ making in angle $\theta$ with the pass axis of $P_1$ . For what value of $\theta$ is the intensity of emergent light zero?
(ii) A third polaroid is placed between $P_1 and P_2$ with its pass axis making an angle $\beta$ with the pass axis is $P_1$ . Find the value of $\beta$ for which the intensity of light from $P_2$ is $\frac{I_0}{8}$ , where $I_0$ is the intensity of light on the polaroid $P_1$ .

20. a. The work function for cesium is 1.8eV. Light of $4500\mathring{A}$ is incident on it. Calculate
(i) the maximum kinetic energy of the emitted photoelectron
(ii) maximum velocity of the emitted photoelectron
(iii) if the intensity of the incident light is doubled, then find the maximum kinetic energy of the emitted photoelectron
Given $h = 6.6 \times 10^{-34} Js,\ m_e = 9.1 \times 10^{-31} kg,\ c = 3 \times 10^8 ms^{-1}$

**(OR)**

b. Find the maximum wavelength of electromagnetic radiation, which can create a hole-electron pair in germanium. Given that forbidden energy gap in germanium is 0.72 eV.
Given $h = 6.62 \times 10^{-34} Js; e = 1.6 \times 10^{-19} c$

21. Draw a block diagram of a full-wave rectifier with capacitor filter. Draw input and output (filtered) voltage of rectifier.

22. The objective of an astronomical telescope has a diameter of 150 mm and a focal length of 4 m. The eyepiece has a focal length of 25 mm. Calculate the magnifying and resolving power of telescope (λ = 6000 $\mathring{A}$ for yellow colour).

23. Using Bohr's postulates for hydrogen atom, show that the total energy (E) of the electron in the stationary states can be expressed as the sum of kinetic energy (K) and potential energy (U), where $K = -\frac{1}{2}U$.Hence deduce the expression for the total energy in the $n^{th}$ energy level of hydrogen atom.

24. Define the term
(i) mass defect
(ii) binding energy for a nuceus and state the relation between the two.
For a given nuclear reaction,the B.E/nucleon of the product nuclear/nuclei is more than that for the original nucleus/nuclei.Is this nuclear reaction exothermic or endothermic in nature?Justify your choice.

**5 Marks** 6 x 5 = 30

25. a. Consider two coherent sources $S_1$ and $S_2$ producing monochromatic waves to produce Interference pattern.

QB365™ QUESTION BANK 365

Let the displacement of the wave produced by $S_1$ be given by $Y_1 = a\cos\omega t$ and the displacement by $S_2$ be $Y_2 = a\cos(\omega t + \phi)$. Find out the expression for the amplitude of the resultant displacement at a point and show that the intensity at that point will be $I = 4a^2\cos^2\frac{\phi}{2}$ Hence, establish the conditions for constructive and destructive interference.

**(OR)**

b. Monochromatic light of wavelength 632.8 nm is produced by a helium-neon laser. The power emitted is 9.42mW.
(a) Find the energy and momentum of each photon in the light beam.
(b) How many photons per second, on the average, arrive at a target irradiated by this beam? (Assume the beam to have uniform cross-section which is less than the target area).
(c) How fast does a hydrogen atom have to travel in order to have the same momentum as that of the photon.

26.a. (i) State Huygens' principle. Using this principle, draw a diagram to show how a plane wavefront incident at the interface of the two media gets refracted when it propagates from a rarer to a denser medium. Hence, verify Snell's law of refraction.
(ii) Is the frequency of reflected and refracted light same as the frequency of incident light?

**(OR)**

b. (i) State briefly the processes involved in the formation of p-n junction explaining clearly how the depletion region is formed?
(ii) Using the necessary circuit diagrams, show how the I-V characteristics of a p-n junction are obtained in
(a) forward biasing
(b) reverse biasing
How are these characteristics made use of in rectification?

27.a. Draw an astronomical telescope, when the final image is formed at the least distance of distinct vision (D) from the eye. Define the magnifying power of the astronomical telescope and derive its formula.

**(OR)**

b. Draw a ray diagram showing the image formation by a compound microscope. Hence, obtain the expression for total magnification, when the image is formed at infinity.

**Assertion and reason** 4 x 1 = 4

28 **Assertion (A)** : On increasing the frequency of light, larger number of photoelectrons are emitted.
**Reason (R)** : The number of electrons emitted is directly proportional to the intensity of incident light.
**Codes:**
(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is NOT the correct explanation of A
(c) A is true but R is false
(d) A is false and R is also false

29 **Assertion (A)** : The direction of diffusion current in a junction diode is from n-region to p-region.

QB365 QUESTION BANK 365

**Reason (R) :**The majority current carriers diffuse from a region of lower concentration to a region of higher concentration.

**Codes:**

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false and R is also false.

30 **Assertion (A):** The ground state of an atom is the state of lowest energy, with all electrons in their lowest possible energy levels.

**Reason (R):** In the ground state, electrons occupy the lowest energy orbitals available.

**Codes:**

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false and R is also false.

31 **Assertion (A)**: The binding energy per nucleon is higher for heavier nuclei compared to lighter nuclei.

**Reason (R):** In heavier nuclei, the attractive nuclear force overcomes the electrostatic repulsion between protons, resulting in higher binding energy per nucleon.

**Codes:**

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false and R is also false.

QB 365 QUESTION BANK 365

**Case Study Questions** 2 x 4 = 8

32 Dual Nature of Radiation, introduces the concept that light and other forms of electromagnetic radiation exhibit both wave-like and particle-like properties, a core principle of quantum mechanics. The wave-particle duality is particularly highlighted by the photoelectric effect, which is the emission of electrons or other free carriers when light shines on a material. Albert Einstein, building on the work of Max Planck, proposed that light is made up of packets of energy called 'quanta' or 'photons,' each carrying a discrete amount of energy proportional to its frequency (E=hf, where h is Planck's constant). This explanation solved the mystery of the photoelectric effect, which couldn't be adequately explained by classical wave theory. Similarly, de Broglie hypothesized that particles such as electrons can exhibit wave-like properties, thereby introducing the idea of matter waves.

**1.What does the dual nature of radiation refer to?**

A) Radiation can exhibit both wave-like and particle-like properties.

B) Radiation can be either harmful or beneficial.

C) Radiation can be both visible and invisible.

D) Radiation can be both ionizing and non-ionizing.

**2.What is the photoelectric effect?**

A) The absorption of electrons when light shines on a material.

B) The emission of electrons or other free carriers when light shines on a

material.
C) The reflection of light from a material.
D) The refraction of light as it passes through a material.

**3.Who proposed that light is made up of packets of energy called 'quanta' or 'photons'?**

A) Niels Bohr
B) Werner Heisenberg
C) Max Planck
D) Albert Einstein

**4.What does 'E=hf' represent in the context of photon energy?**

A) E is the energy of the photon, h is Planck's constant, and f is the frequency of the light.
B) E is the energy of the photon, h is the frequency of the light, and f is Planck's constant.
C) E is the frequency of the light, h is the energy of the photon, and f is Planck's constant.
D) E is the frequency of the light, h is Planck's constant, and f is the energy of the photon.

**5.Who hypothesized that particles such as electrons can exhibit wave-like properties?**

A) Max Planck
B) Niels Bohr
C) Louis de Broglie
D) Werner Heisenberg

QB365™ QUESTION BANK 365

33 A compound microscope is an optical instrument used for observing highly magnified images of tiny objects. Magnifying power of a compound microscope is defined as the ratio of the angle subtended at the eye by the final image to the angle subtended at the eye by the object, when both the final image and the object are situated at the least distance of distinct vision from the eye. It can be given that: $m = m_e \times m_o$ where $m_e$ is magnification produced by eye lens and $m_o$ is magnification produced by objective lens. Consider a compound microscope that consists of an objective lens of focal length 2.0 cm and an eyepiece of focal length 6.25 cm separated by a distance of 15 cm.

(i) The object distance for eye-piece, so that final image is formed at the least distance of distinct vision, will be

**(a) 3.45 cm (b) 5.cm (c) 1.29 cm (d) 2.59 cm**

(ii) How far from the objective should an object be placed in order to obtain the condition described in part(i)?

**(a) 4.5 cm (b) 2.5 cm (c) 1.5 cm (d) 3.0 cm**

(iii) What is the magnifying power of the microscope in case ofleast distinct vision?

**(a) 20 (b) 30 (c) 40 (d) 10**

(iv) The intermediate image formed by the objective of a compound microscope is

**(a) real, inverted and magnified**

**(b) real, erect, and magnified**

**(c) virtual, erect and magnified**

**(d) virtual, inverted and magnified**

(v) The magnifying power of a compound microscope increases with

**(a) the focal length of objective lens is increased and that of eye lens is decreased**

**(b) the focal length of eye lens is increased and that of objective lens is decreased**

**(c) focal lengths of both objects and eye-piece are increased**

**(d) focal lengths of both objects and eye-piece are decreased.**

QB365™
QUESTION BANK 365